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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-9889

EXAMINER

KANG, DONGHEE

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 09/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/073,240

Applicant(s)

TAKATANI ET AL.

Examiner

Donghee Kang

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 4 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/381,396.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: _____

DETAILED ACTION

Priority

1. This application appears to be a division of Application No. 09/381,396 filed September 20, 1999. A later application for a distinct or independent invention, carved out of a pending application and disclosing and claiming only subject matter disclosed in an earlier or parent application is known as a divisional application or "division." The divisional application should set forth only that portion of the earlier disclosure which is germane to the invention as claimed in the divisional application.

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 09/381,396 filed on September 20, 1999.

Election/Restrictions

2. Claim 4 is withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected embodiment, there being no allowable generic or linking claim.

Information Disclosure Statement

3. Acknowledgment is made of receipt of applicant's Information Disclosure Statement (PTO-1449) filed February 13, 2002.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2811

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims **1-2 & 6** are rejected under 35 U.S.C. 102(e) as being anticipated by Suzuki (US 6,151,240).

Re claims **1-2**, Suzuki teaches a semiconductor device comprising:

an oxide high-dielectric constant or ferroelectric film; and an upper capacitor electrode provided on said film, wherein said upper electrode consists of ruthenium and an additional impurity element (See Col.5, lines 46-57 & Col.2, lines 56-57), wherein said impurity element is barium.

Suzuki does not expressly teach the upper capacitor electrode being subjected to a hydrogen atmosphere during manufacturing. This is a product-by-process limitation. "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production.

If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process". In re Thorpe, 777F. 2d 695,698 USPQ 964, 966 (Fed. Cir.1985). See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claim in "product by process" claim or not.

Suzuki does not expressly teach additional impurity element has an action of suppressing the catalytic activity of said metal element. However, this feature is inherent because Suzuki has a same material as claimed in claim 1-2.

6. Claim **6 & 8** are rejected under 35 U.S.C. 102(e) as being anticipated by Okudaira et al. (US 6,078,072).

Okudaira et al. teach a semiconductor device comprising:

a capacitor structure having an oxide high-dielectric-constant or ferroelectric thin film and a metal electrode,

wherein surfaces of polycrystal grains of the metal mainly containing in said metal electrode of said capacitor are covered with a compound of said metal and another element,

wherein said film is made of BST. Okudaira et al. do not expressly teach additional impurity element has an action of suppressing the catalytic activity of said metal element. However, this feature is inherent because Suzuki has a same material as claimed in claim 1-2.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim **3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki.

Suzuki does not teach the concentration of said impurity element in said upper electrode is 10 atom% or less. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the concentration of the impurity element, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

9. Claims **5 & 7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Okudaira et al. (US 6,078,072) in view of H.P.Bonzel et al. (J. of Chemical Physics, v 58, pp 4617-4624, 1973).

Okudaira et al. teach a semiconductor device comprising (Fig.1):

an oxide high-dielectric-constant or ferroelectric film (7); a lower capacitor electrode (1) provided under said film; and an upper electrode (9) provided on said film, wherein said upper electrode consists of platinum (Pt), and an additionally containing oxygen. See Col.8, lines 23-50.

Okudaira et al. do not teach platinum containing any one of sulfur, selenium, tellurium, silicon, phosphorus, arsenic, boron, and bismuth. However, Bonzel et al. teach the platinum containing a sulfur to make lowering the effect of catalytic that causes peeling off the PZT thin film (pp. 4624, lines 8-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add sulfur to the platinum upper electrode since adding sulfur to the platinum lowers the effect of catalytic that causes peeling off the PZT thin film.

10. Claims **9-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Okudaira et al. (US 6,078,072) in view of Suzuki (US6,151,240).

Re claims **9-10**, Okudaira et al. teach a semiconductor memory including a memory cell comprising a MISFET, having a pair of semiconductor regions and a gate electrode, and a capacitor formed on a principal plane of a semiconductor substrate, said capacitor comprising (Fig.1):

a lower electrode (1) electrically connected to one of said semiconductor regions of said MISFET; a ferroelectric film (7) formed on the surface of said lower electrode; an upper electrode (9) formed on the surface of the ferroelectric film; an insulating film (31) formed in such a manner as to cover said upper electrode; and a refractory metal layer (35) connected to said upper electrode via an opening formed in said insulating film. See also Col.8, line 14-Col.9, line 22.

Okudaira et al. do not teach the upper electrode containing an element selected from a group consisting of palladium, ruthenium, and iridium and additionally containing an impurity element.

Suzuki teaches the upper electrode consisting of an element selected from a group consisting of ruthenium, iridium, and nickel containing an impurity element (Col.2, lines 4-57) instead of Pt because Pt electrodes are liable to peel off. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form upper electrode using ruthenium containing barium in order to prevent peeling off from ferroelectric film.

Re claim **11**, Okudaira et al. teach said lower electrode is a storage electrode and said upper electrode is a plate electrode.

Re claim **12**, Okudaira et al. as modified by Suzuki do not expressly teach the concentration of said impurity element in said upper electrode is 10 atom% or less. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the concentration of the impurity element, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re claim **13**, Okudaira et al. teach said impurity element is not added to said lower electrode.

Re claim **14**, Okudaira et al. teach said refractory metal is tungsten (Col.9, line 11).

Re claim **15**, Okudaira et al. teach a semiconductor memory including a memory cell comprising a MISFET having a pair of semiconductor regions and a gate electrode, and a capacitor formed on a principal plane of a semiconductor substrate, said capacitor comprising:

A lower electrode (1) electrically connected to one of said semiconductor region of said MISFET; an ferroelectric film (7) formed on the surface of said lower electrode; an upper electrode mainly containing platinum and additionally containing an oxygen (Col.8, lines 23-50), an insulating film (31) formed in such a manner as to cover said

upper electrode; and a refractory metal layer (35) connected to said upper electrode via an opening formed in said insulating film.

Okudaira et al. do not teach platinum containing any one of sulfur, selenium, tellurium, silicon, phosphorus, arsenic, boron, and bismuth. However, Bonzel et al. teach the platinum containing a sulfur to make lowering the effect of catalytic that causes peeling off the PZT thin film (pp. 4624, lines 8-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add sulfur to the platinum upper electrode since adding sulfur to the platinum lowers the effect of catalytic that causes peeling off the PZT thin film.

Re claim **16**, Okudaira et al. teach said lower electrode is a storage electrode and said upper electrode is a plate electrode.

Re claims **17 & 20**, Okudaira et al. as modified by Suzuki do not expressly teach the concentration of said impurity element in said upper electrode is 10 atom% or less. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the concentration of the impurity element, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re claims **18 & 21**, Okudaira et al. teach said impurity element is not added to said lower electrode.

Re claims **19 & 21**, Okudaira et al. teach said refractory metal is tungsten (Col.9, line 11).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Donghee Kang
Examiner
Art Unit 2811

dhk